



**BUILT TO LAST:  
RESILIENCY THROUGH  
SEISMIC RETROFITTING IN**

# Portland, Oregon



**FEMA**

**RiskMAP**  
Increasing Resilience Together

## PORTLAND, OR

In 2014, the City of Portland, Oregon's Office of Emergency Management (OEM) and the Federal Emergency Management Agency (FEMA) approved a pilot project to use federal emergency monies to seismically retrofit several dozen homes. This project leveraged the customer engagement and contractor infrastructure established by northwest nonprofit, Enhabit, an organization that focuses on social impact through better living spaces.

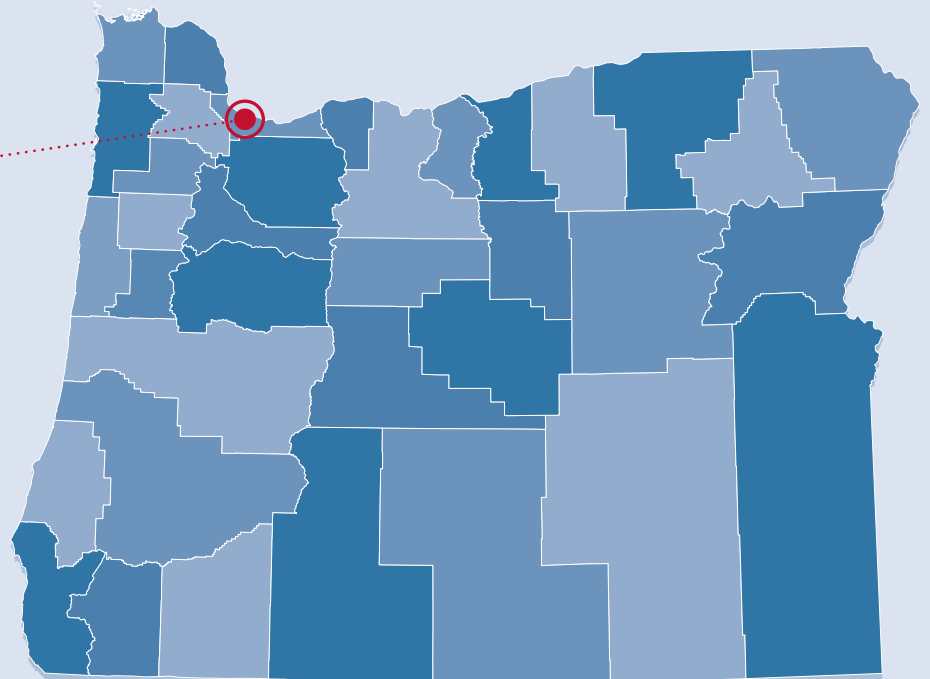
The pilot successfully demonstrated that homes are a powerful leverage point for action—delivering simultaneous outcomes for multiple public policy objectives. For the City of Portland, these included:

- › Mitigating future seismic damage and keeping people in their homes;
- › Supporting aggressive climate and energy reduction goals by bundling energy efficiency and seismic services into one convenient package; and

- › Addressing equity goals by expanding service reach to below-median value per foot homes, ensuring access for underserved populations.

The pilot was successful, both in completion of home retrofits and by drawing awareness to the problem (earthquake preparedness)— and the solution (bolting homes to their foundations). There are 100,000 additional homes in Portland that need upgrading, so the City, OEM, and FEMA began work on Pilot 2.0 to strengthen more homes.

In July 2015, the New Yorker article, *The Really Big One*, presented a sobering doomsday narrative on the expected aftermath of a seismic event in the Pacific Northwest. The timing was fortuitous for a pre-planned press event with City of Portland Commissioner Steve Novick announcing the potential for FEMA grant dollars to invest in seismic



strengthening for Portland homes. These two media moments generated urgency and interest from thousands of homeowners interested in seismic retrofits—urgency that continues today.

The pilot partnership benefitted from a \$100,000 FEMA grant address some of the 100,000 homes in Portland in need of seismic retrofits. On average, FEMA invests approximately \$30,000 per home for disaster recovery efforts.

The City of Portland Seismic Retrofit pilot set out to demonstrate how a \$3,000-per-home incentive to mitigate seismic damage could not only yield dramatic savings for local and federal government agencies, but could also increase a community's ability to survive inevitable challenges like windstorms, heat waves, and natural disasters.



## Goal of Showcase:

This booklet highlights the City of Portland's success in developing a residential retrofit program to increase the seismic resiliency of the city to help residents stay in place after a seismic event. This booklet, telling Portland's story, is part of a collection, the FEMA Region X Mitigation Showcase, to illustrate different ways in which local communities have leveraged partnerships and collaborated with state and federal partners to complete mitigation projects that address vulnerabilities to earthquakes and/or tsunamis. These narratives describe how project partners worked together to effectively navigate FEMA Hazard Mitigation Assistance requirements, build political and public support, and describe what lessons were learned throughout the project process. Information provided in each booklet intends to inspire and support other communities that wish to pursue similar mitigation action.



## Mitigation Project:

In an ongoing project, as of January 2018, the City of Portland has completed over 100 retrofits of residential homes. The city established a critical partnership with Portland-based non-profit, Enhabit. Enhabit is a company specializing in home energy upgrades and provided the city increased capacity to manage grant requirements, market and advertise the opportunity of the residential retrofit program, and conduct training to contractors to help streamline reimbursement requirements. Success of the project is attributed to this public-private partnership as well as through sustained political and public support.



## Defining the Hazard:

The City of Portland is at-risk from earthquake impacts from the Cascadia Subduction Zone (CSZ). An estimated 100,000 homes were built before statewide codes were implemented in the 1970s. This leaves many vulnerable to the impacts of seismic events. The last major earthquake occurred in January 1700, over 300 years ago. To help meet the city's goal of helping residents stay in place after a seismic event, HMA funds were leveraged to develop a residential seismic retrofit program.







PHOTO: Participating homeowner points to a retrofit project.

The City of Portland is vulnerable to earthquake impacts from the distant Cascadia subduction zone, as well as smaller, yet much closer, crustal faults. Buildings in the city would be significantly impacted, especially buildings built before 1970. City government took steps to increase public awareness of this vulnerability and advertised what homeowners could do to retrofit, prepare, or look for in new homes or businesses. This work included developing a volunteer seismic retrofit program in the early 2000s. Development Services completed their first version of a code guide for homeowners and posted it to their website to provide at least some guidance for the more than 100,000 homes built before statewide building codes were implemented in the 1970s. While the city conducted public outreach around this guidance and risk, public interest in voluntary retrofitting was minimal.

In 2014, momentum for earthquake preparedness increased, following strong local political support from Portland City Commissioner, Steve Novick, and U.S. Representative, Earl Blumenauer. With this political support that included contributions from the city's general fund, the Portland Bureau of Emergency Management (PBEM) worked with the Oregon State Hazard Mitigation Officer (SHMO) to secure just over \$100,000 through FEMA's Hazard Mitigation Grant Program (HMGP) to develop a pilot program for residential retrofits.

➤ “One of Portland’s goals for building a resilient community is to keep people in their homes following an earthquake. With tens of thousands of homes constructed before 1970 and modern seismic codes, a large percentage of our building stock is vulnerable. This program successfully demonstrated how local government partnering with a non-profit to leverage federal funds could incentivize homeowners to take action to retrofit their homes before the next earthquake.”

– Carmen Merlo, Deputy Chief Administrative Officer, City of Portland

## Project Timeline:



The pilot program, the Seismic Demonstration Project, was modeled after a City of Seattle small retrofit project. Planners with the City of Seattle emphasized the importance of reaching out to neighboring communities for information that could support addressing risk across jurisdictional boundaries.

Through this pilot project, the PBEM coordinated with a local nonprofit, Enhabit, to build project/construction management capacity. Enhabit is dedicated to pursuing a positive “social impact through better living spaces” and was already an established entity within the Portland community for their work increasing the energy efficiency of homes. While the city maintained communication and coordination with FEMA Hazard Mitigation Assistance (HMA) staff and the SHMO, Enhabit capitalized on its network of contractors to serve as the project’s initial coordinator and point of contact for homeowners. Enhabit also managed reimbursement collection and worked with homeowners and contractors to provide that information to the SHMO. The initial program successfully retrofitted 23 homes in Portland.

These initial homes were selected because they were already engaged with Enhabit in 2014 for energy

upgrade projects. Through the pilot program, a seismic retrofit component was added to their home projects, through early 2015.

In 2015, PBEM worked with the SHMO to explore other FEMA funding opportunities and submitted a sub-application to the state for a FEMA Pre-Disaster Mitigation (PDM) grant. Complementary efforts occurring at the same time in the city’s Bureau of Development Services led to the strategic release of updated guidance on engineering standards for seismic retrofits, in accordance with FEMA guidance and the Structural Engineer’s Association of Oregon. This update included training for contractors on the details of choosing retrofit plans and anchors, how to navigate the city permitting process, and other keys to successful residential retrofitting.

In 2015, the city was awarded over \$500,000 through a PDM grant to fund the Residential Seismic Strengthening Program to retrofit 150 homes.

Wherever possible, Enhabit encouraged and supported energy efficiency upgrades and other home betterment projects as residents were already installing earthquake retrofit improvements.

➤ “Having an entity like Enhabit has helped Portland accomplish the project in a timely, professional manner. Their expertise has been welcome.”

– Angie Lane, Oregon State Hazard Mitigation Officer



PHOTO: Residential retrofit projects can include bracing and strengthening foundations with plywood or automatic shut-off valves for gas and utility lines.



An awareness and customer demand boost stemming from The New Yorker article by Kathryn Shultz resulted in nearly 4,000 people signing up to retrofit their homes. Enhabit was tasked with managing and sustaining the enormous demand and with creating an equitable lottery system to choose which homes would receive the FEMA incentives. Low-income or under-represented homeowners were given preference. These additional factors were considered in the prioritization:

- ▶ Building foundation subgrade is not steeper than 3 horizontal feet to 1 vertical foot
- ▶ Structure may not be in the floodplain
- ▶ Cripple wall height cannot exceed 48 inches in one or two-story buildings and does not exceed 14 inches in three story buildings
- ▶ Structure has a continuous concrete foundation around its entire perimeter
- ▶ Structure may not be in proximity to or contain critical habitat; and,
- ▶ Structure may not be more than three stories.

The lottery system filtered candidates to a smaller pool of eligible homeowners: 150 homes were selected for incentivized retrofits, with another 150 identified as backups should the initial pool decline to participate.

At the same time, Enhabit recognized an opportunity to continue raising public awareness, specifically targeted to those who originally indicated interest. Enhabit published an Earthquake Preparedness guide, purchased online advertisements, and created ongoing communication campaigns to encourage action for earthquake strengthening.

## Lesson learned: Communicate expected timelines at the start of the project.

Due to the unexpected amount of time it took to connect with homeowners, verify interest, confirm that the owner could provide the 50 percent grant match requirement, and select contractors, some homeowners opted to not participate in the program. Enhabit tried to engage all 300 homeowners, but only 90 moved forward with a retrofit. To meet the grant requirements for 60 additional retrofit projects, Enhabit revisited the original pool of 4,000 homeowners to select an additional 500. The project is ongoing as of December 2017 with the assumption that the 60 additional retrofit projects will be complete.

A common question from homeowners throughout both programs was, “Should I buy earthquake insurance?” Through this process, the city and Enhabit learned that when choosing between retrofitting and earthquake insurance, retrofitting is preferred because it provides safety to inhabitants. Insurance, however, may offset some of the costs from earthquake-caused damages, especially those that are non-structural. Through the pilot demonstration program and the current residential retrofit program, the city is making significant strides towards helping its community remain safely in place following an earthquake event. This will contribute to the community’s ability to more quickly return to regular life, thereby reducing economic impacts and preserving the community’s identity.

As of December 2017, the program has completed 120 home retrofits and is expected to complete all 150 homes by October 2018.

As with the initial Seismic Demonstration Project, Enhabit extensively manages the program and coordinates communication with homeowners and contractors. Enhabit additionally developed training for contractors to introduce retrofitting principles, codes, or best practices, where needed, as well as describing the process and requirements for reimbursement through the FEMA PDM grant. This training strengthened positive relationships with the contractors and smoothed out the reimbursement process. Key partnerships with contractors, city planners and officials, Enhabit, state, and federal partners were strengthened over the course of the project. These relationships and open lines of communication contributed to the success of the program.



PHOTO: Danny Kelley, Enhabit



“We measure the impact of our work by how well we are building stronger communities in the markets we serve,” says Enhabit CEO, Tim Miller. “This initiative demonstrates once again the power of public-private partnerships to solve complex problems facing our neighbors, and to protect investments they’ve made in their homes.”

While overall public interest in this residential retrofit program has diminished somewhat, overall city-wide public awareness of earthquake risk has increased since the pilot project in 2014. City and state seismic mitigation and risk-reduction efforts continue for existing structures and measures are being taken to further ensure new or substantially improved structures are built taking earthquake risk into account. In June 2017, Oregon Governor Kate Brown signed HB2140 into law, effective January 1, 2018, to require seismic disclosure: Sellers simply state whether they know the house has been retrofitted — it does not require them to find out or make remedies. Because selling a home is a time when owners often get an inspection and make safety repairs, this measure brings the issue to people’s attention at a time when they are more likely to act on the information. The initial Seismic Demonstration Project and the larger residential retrofit program were targeted efforts for specific homeowners. However, both programs were strongly connected to broader city and state-wide campaigns for increasing the public’s awareness of earthquake risk. As Portland grows and changes in the future, these programs, outreach, and guidelines will reduce overall risk and serve as an opportunity to bring together people and partnerships that collectively support this goal.





## Technical Grant Information

Grant 1: Hazard Mitigation Grant Program (HMGP), City of Portland, Seismic Retrofit Demonstration Project

Grant 2: Pre-Disaster Mitigation Grant Program (PDM), Grant EMS-2015-PC-0001, City of Portland, Portland Residential Seismic Strengthening Project

### TOTAL COST OF PROJECT:

- HMGP – \$102,143
- PDM – \$526,257

### SCOPE OF WORK DETAIL:

From the Goettel Benefit-Cost Analysis Report: “Identical BCA approaches and data were used in the HMGP and PDM grant applications. Benefit-cost analysis for the proposed residential seismic retrofit project was conducted using the FEMA Version 5.1 Damage-Frequency Assessment (DFA) Benefit-Cost Analysis module, rather than the Earthquake Structural Seismic Module.” The BCA took a conservative approach to be consistent with FEMA-approved guidelines. The conservation approach includes some assumptions below:

- Benefits from avoiding content damage from failure of cripple walls or homes sliding off foundations were not considered.
- Displacement costs were estimated very conservatively at only \$1.00/SF for one-time costs and \$1.00/SF for monthly costs. These values are much lower than the FEMA values used in the flood BCA module, which are based on the GSA per diem rates for temporary lodging and meals. The GSA rates for Portland are \$137 per day for lodging and \$66 per day (per person) for meals.
- Deaths and injuries from failures of the cripple walls and/or unbolted sill plates were assumed to occur only for the extensive or complete damage states, with none assumed for the slight and moderate damage states.

- The project useful lifetime was assumed to be only 30 years. However, 146 of the 150 homes are more than 50 years old with 87 built before 1940. These older homes would likely have longer useful lifetimes, with a commensurate increase in the net present value of benefits.
- The calculated benefits do not consider the reductions in losses and casualties from the reduced probability of fire following earthquake which are attributable to the retrofits that include gas water heater bracing and/or automatic seismic shutoff valves for gas lines.

The residential seismic retrofit projects for both the HMGP and PDM grants focused on structural retrofits for single-family, wood-frame homes with unbraced cripple walls and/or sill plates that are not bolted to the foundation.

### THESE SEISMIC RETROFITS ARE HIGHLY COST EFFECTIVE BECAUSE:

- They address major seismic deficiencies in single-family wood-frame homes with unbraced cripple walls and/or with sill plates not bolted to the foundation.
- The retrofits are highly effective in reducing seismic risk.
- The retrofit costs are very low relative to building values.

### GRANTS MANAGEMENT:

- Enhabit used publicly available data through [Portland Maps](#) and an in-house GIS technician to conduct this search.
- The SHMO, city project manager, and Enhabit project manager worked together to manage different parts of the grants. Enhabit staff worked directly with homeowners and contractors to gather and organize materials required for reimbursement. City and state partners helped to navigate FEMA grant requirements and coordinate with Enhabit if more or different information was needed from a specific project.
- PDM funds require a 25-percent match. However, for this project the city required a 50-percent match to enable funding to go further. The match contribution was provided by the homeowners. Most homeowners covered this themselves, but Enhabit also offers loan options for retrofitting. They are currently exploring options to address low-income and affordable loans.
- An expectation for grants management is a steep learning curve with each new project. Relying on grant kickoff meetings and clear lines of communication between state and city partners leads to overall success of a project.
- The grant closeout process required oversight for quality control and historic preservation. To accommodate the large number of individual projects, the project team conducted spot checks or sampling.

### RECOMMENDATIONS:

- From PBEM – This type of grant is time intensive so communities with less capacity than Portland would be encouraged to coordinate with adjacent communities or find a similar non-profit as a partner. Alternatives would be to try batches of properties or assumptions that would lead to a refinement in the overall process. Additionally, be aware of factors that may contribute to a need for more capacity, for example, a structure over 50-years old triggers a historic review.
- While the overall project has been a success, barriers were experienced throughout the process. A reoccurring barrier for homeowners was the time FEMA grant approval took. Throughout the approval process, a homeowner may buy or sell the structure, lose interest, or decide against the project for another reason. This requires clear communication of timeline expectations at the start of projects. One of these delays was the initial Benefit-Cost Analysis for each parcel, including environmental and historic review. Creative options may exist in the future, such as an average cost per structure or a BCA waiver if a structure has been approved for a past project, but for now this is an investment in time.
- The project team dealt with each retrofit funding situation individually—this was a time-consuming task. The team explored selecting a fixed-funding amount to apply across the board for those homes that meet the criteria. This would greatly reduce the administrative burden and expedite the program's implementation.

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